NSF Research Traineeship (NRT) Program

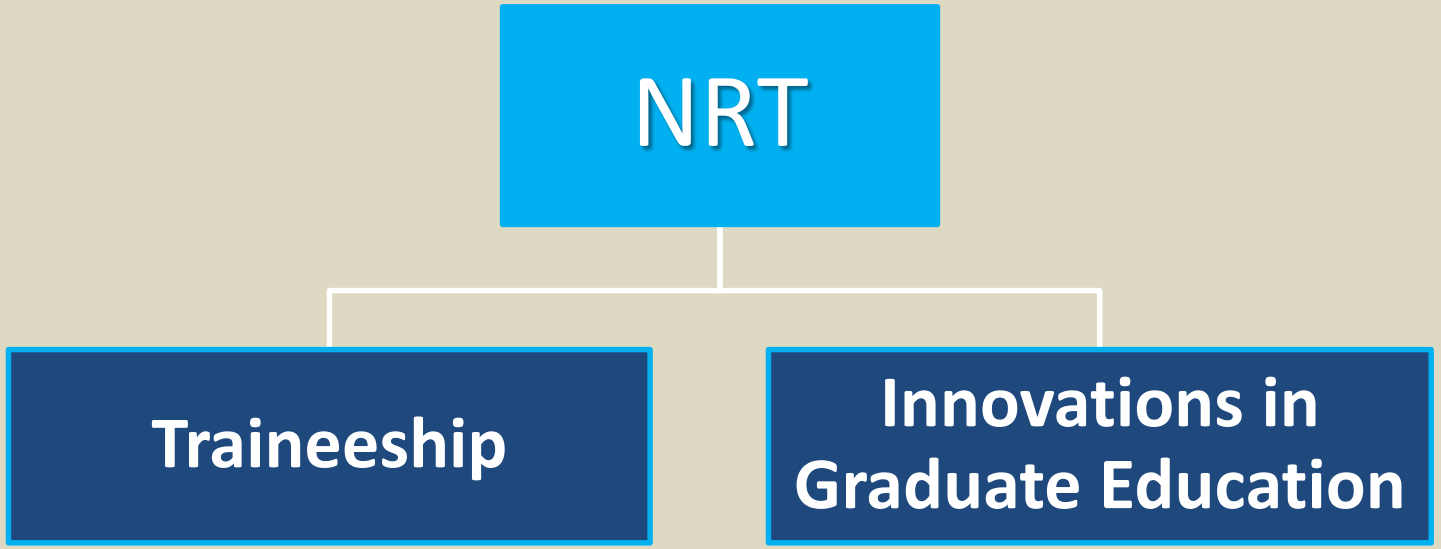
Innovative Interdisciplinary Graduate Training

Division of Graduate Education
Directorate For Education and Human Resources
National Science Foundation

NSF Research Traineeship (NRT) Program

- A Foundation-wide program launched in 2014 as the successor to IGERT
- **Goals:**
  - Advance cutting-edge interdisciplinary research in **high-priority areas**
  - Increase the capacity of graduate programs to produce STEM professionals with **professional skills for a range of careers**
  - Develop **innovative approaches** that will promote transformative improvements in graduate education.

NSF Research Traineeship (NRT) Program



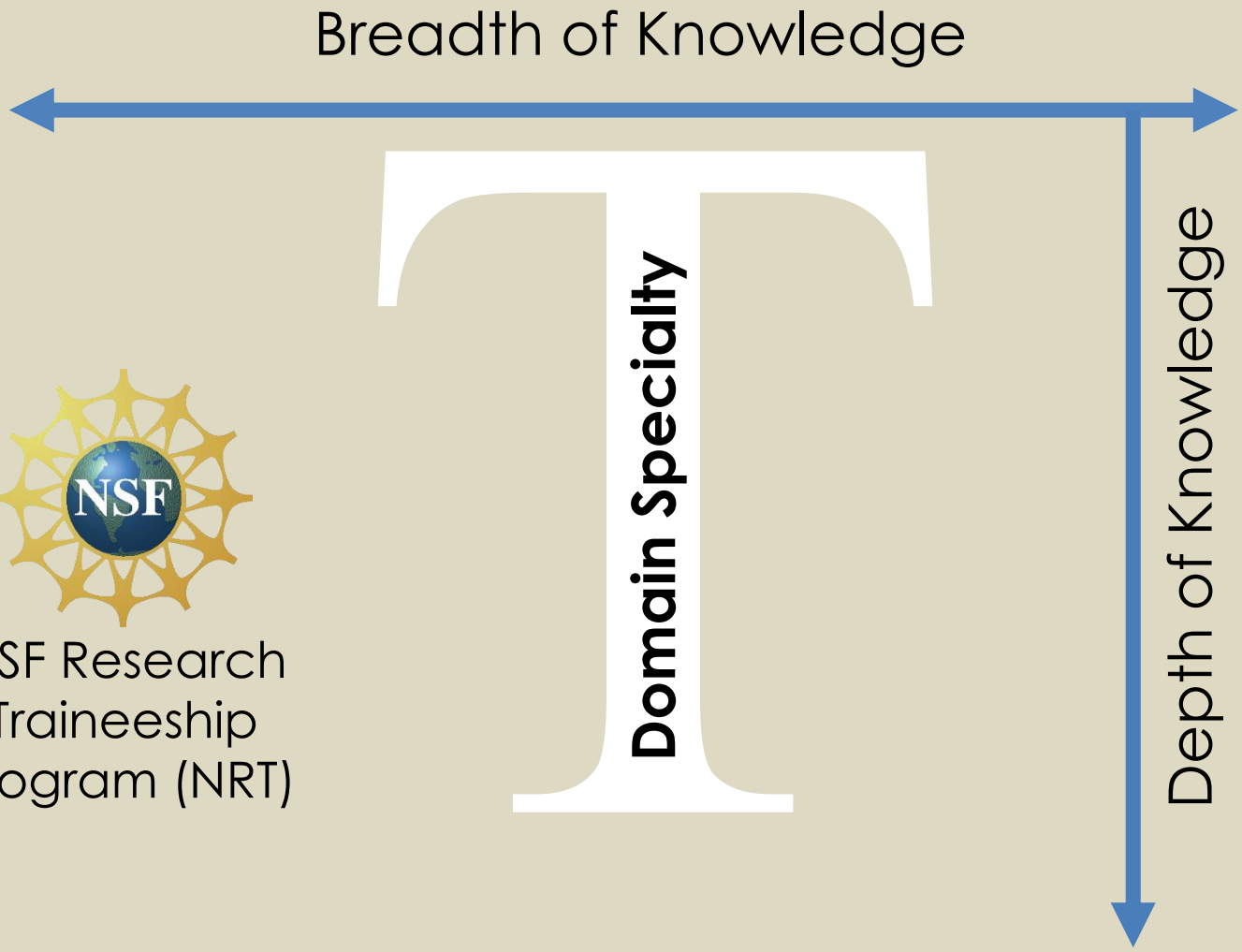
- Comprehensive training
- Interdisciplinary theme
- MS and/or PhD
- 5 years, up to $3M total
- Limit 2 submission/institution

- Test-bed/pilot projects
- No student support
- MS and/or PhD
- 3 years, up to $500K
- Limit 2 submission/institution

FY 2016 Traineeship Priority Areas

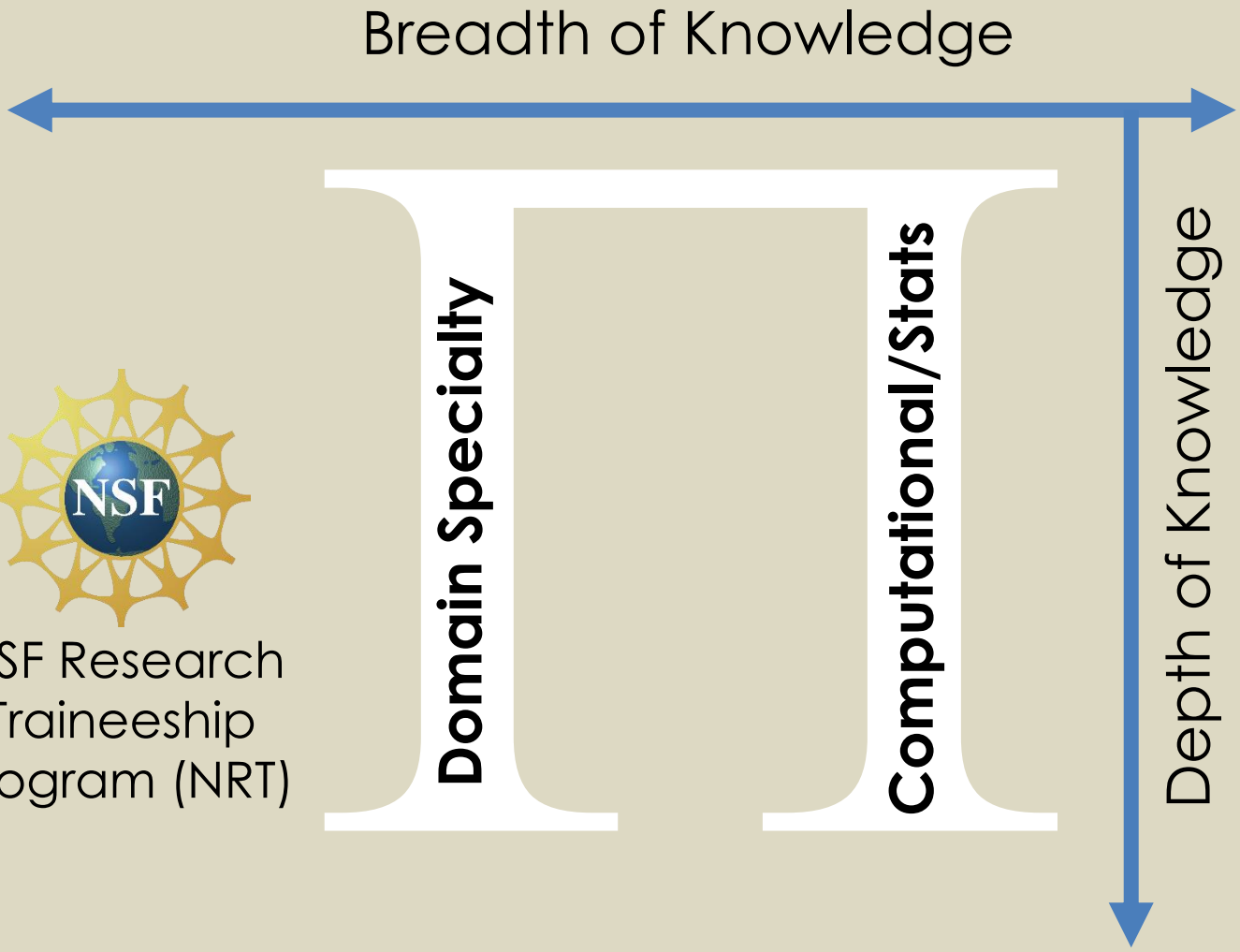
- **D**ata-**E**nabled **S**cience & **E**ngineering (**DESE**)
- **I**nnovations at the **N**exus of **F**ood, **E**nergy and **W**ater **S**ystems (**INFEWS**)
- **U**nderstanding **t**he **B**rain (**UtB**)
- Other Crosscutting, Interdisciplinary Themes

"T-Shaped" Student



NSF Research Traineeship Program (NRT)

"π -Shaped" Student



NSF Research Traineeship Program (NRT)

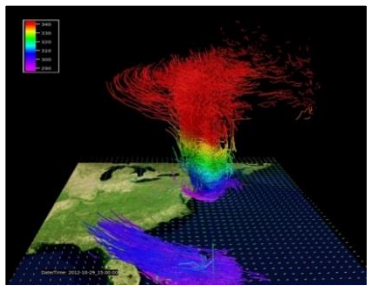
Data Enabled Science & Engineering Priority Area

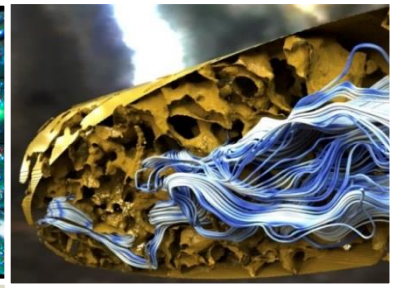
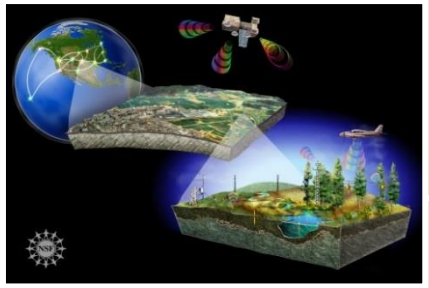
New interdisciplinary advances

- Mathematical, computational, and statistical algorithms
- Prediction techniques
- Simulation and modeling methodologies

New approaches to data

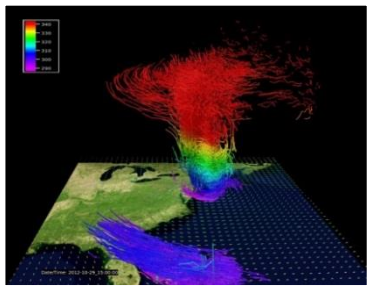
- Collection
- Analysis and visualization
- Integration
- Stewardship

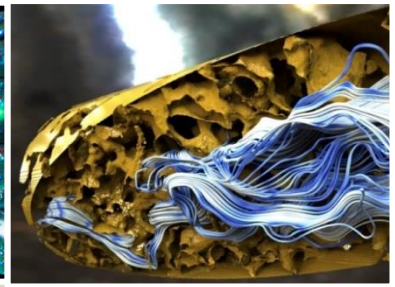
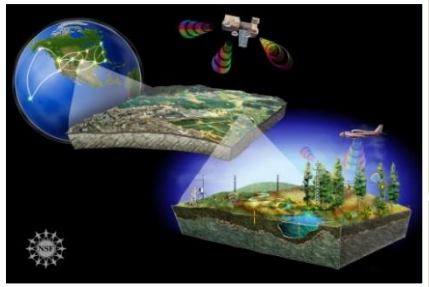



Types of DESE Projects

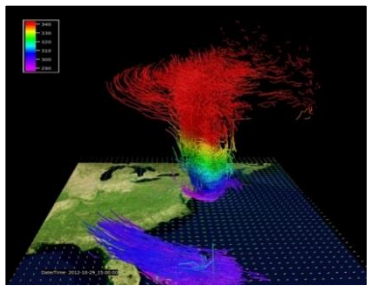
- Partnerships between computational and mathematical and other STEM disciplines to **manage and exploit data sources.**
- Research focused on the development of **novel data-driven approaches and tools** that
  - Advance scientific and engineering discovery
  - Integrate and leverage major cyberinfrastructure investments
- Novel programs that **integrate educational and training** opportunities with major facilities and infrastructure investments.

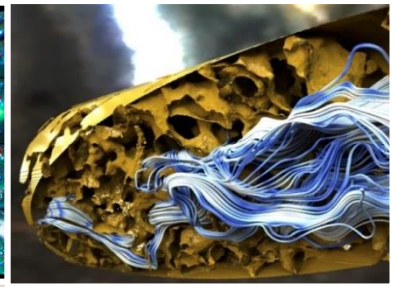
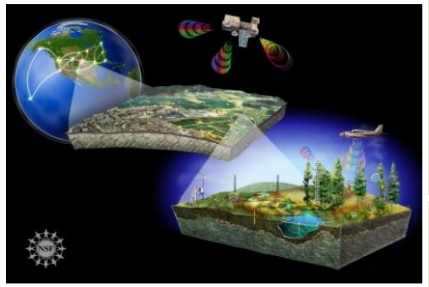



NRT: DESE Numbers

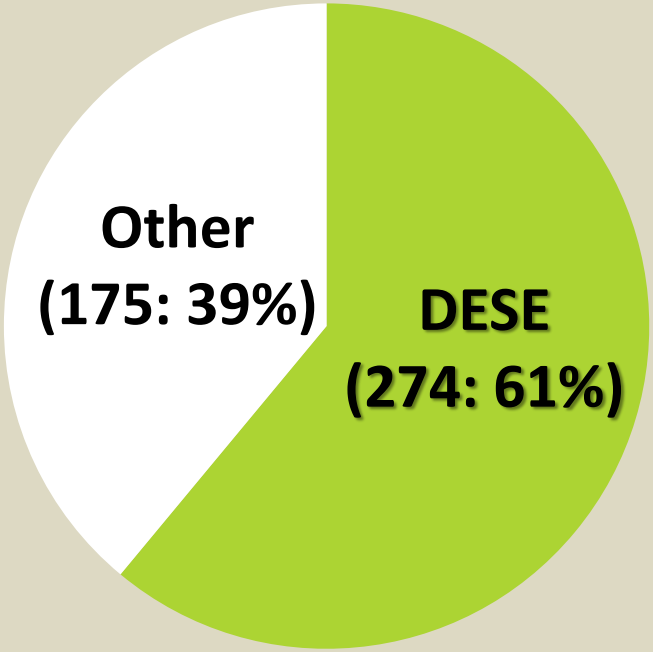
Number of Projects:	12
Average Budget:	$2.97M
Total NSF Support:	$35.6M
Trainees Supported:	439 (36.6/awd)
Total Projected Trainees:	867 (72.2/awd)
% Budget for Participant Support:	61%

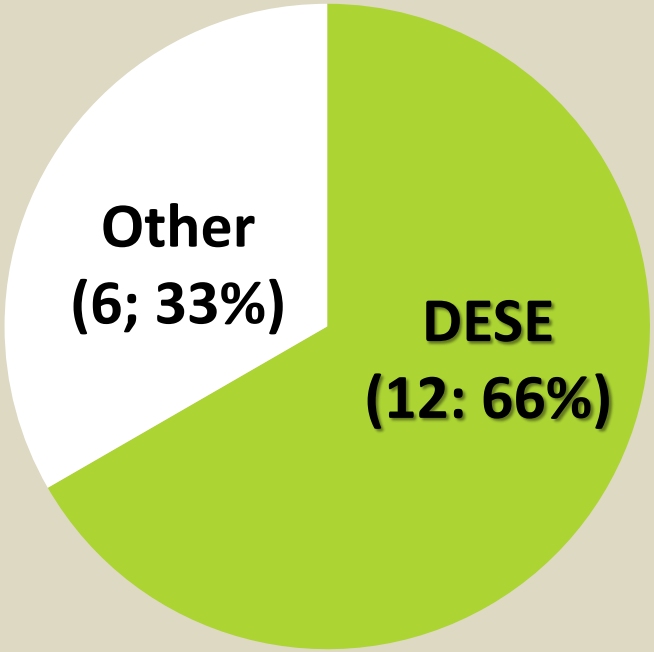



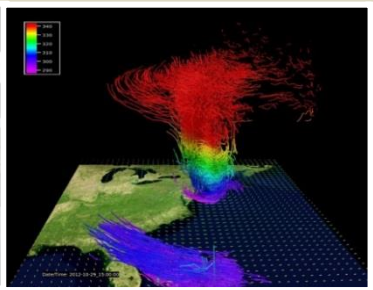
2014-2015 Proposals and Awards

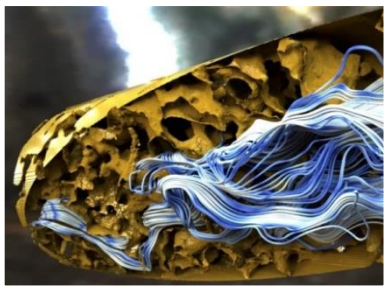
Proposals

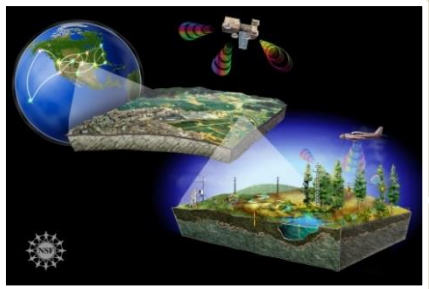


Awards

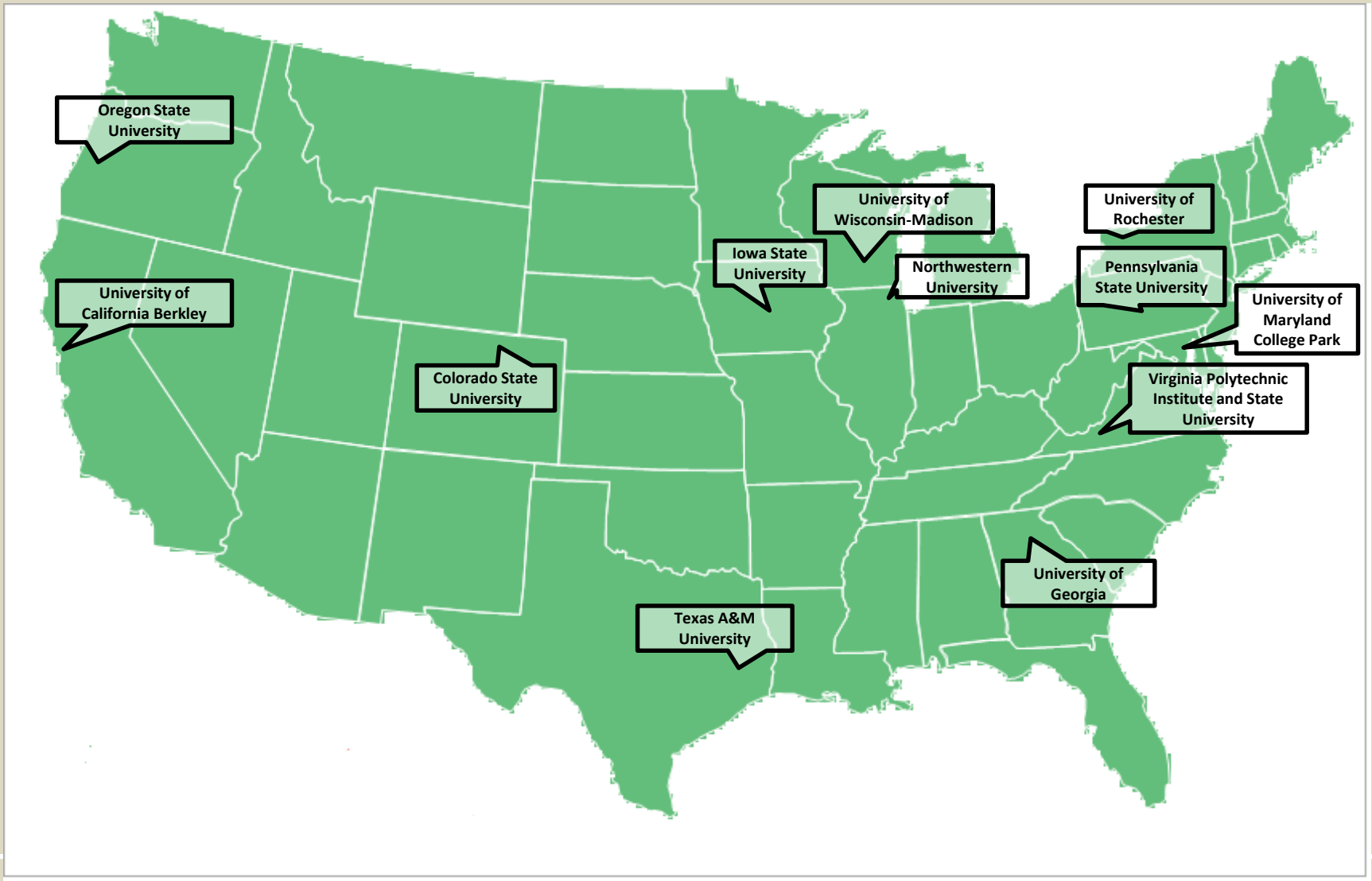






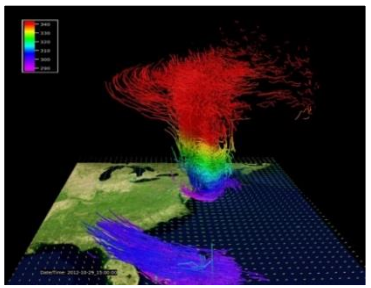


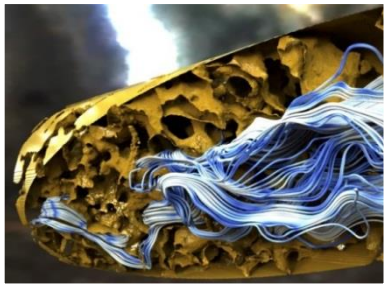
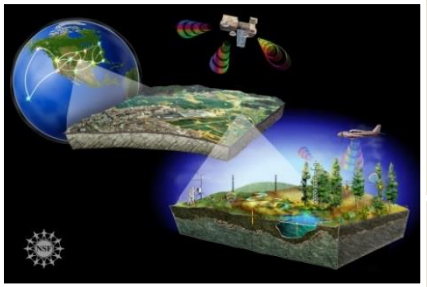
2014-2015 NRT DESE Awards



Common Features of NRT DESE Projects

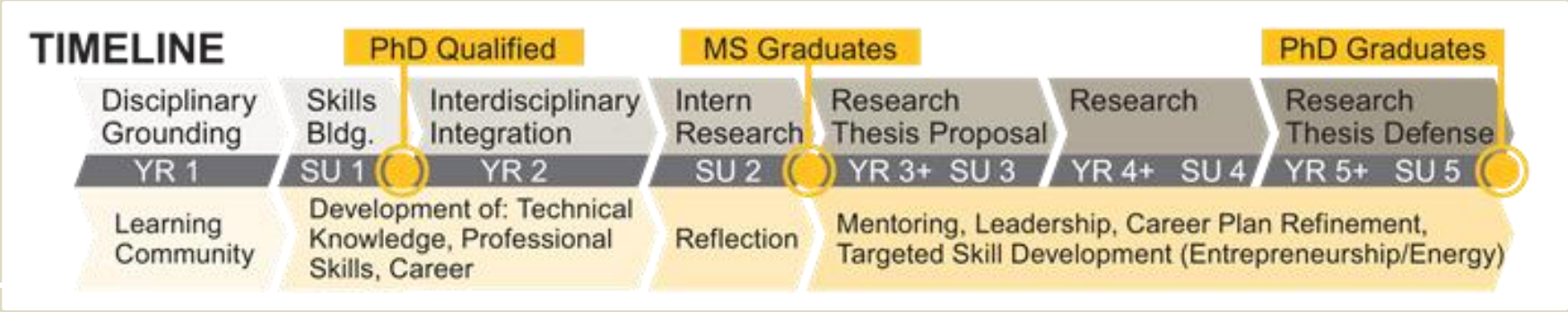
- Intensive training (boot camps) in computational and analytical techniques.
- Vertically-integrated training (faculty and post-docs).
- Entrepreneurial training coupled with industrial internships.
- New interdisciplinary courses in model-based analysis, data storage and management, analytics, and visualization.
- Team Science: opportunities for domain scientists to work with computer and data scientists to develop and pilot novel applications.

Data-Enabled Discovery and Design of Energy Materials (D^3EM)

- PI: Raymundo Arroyave
  Dept. Materials Science & Engineering
  Texas A&M University
- 80+ Trainees (MS and PhD), 6 Departments
- Students and faculty from materials science, informatics, engineering design
- Emphasis on employer-desired professional and technical skills



Data-Enabled Discovery and Design of Energy Materials (D^3EM)

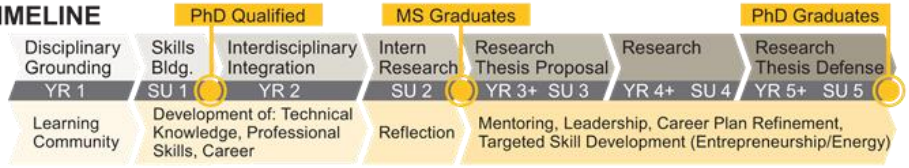
SIX DEPARTMENTS • THREE DISCIPLINES • ONE VISION

Building a collaborative framework for the accelerated development of materials through materials science, informatics, and engineering design.

KEY FEATURES:

- Employer-driven Learning Outcomes
  See survey results: Table 2, Page 6
- Disciplinary Grounding followed by Interdisciplinary Learning
- Reflection through e-Portfolio
- Learning Community
- Faculty Community of Scholars
- Summer School on Computational Materials Science
- Capstone Materials Design Studio
- Energy and Entrepreneurship
- Research on Pedagogical Impact and Dissemination in Scholarly Literature

TIMELINE



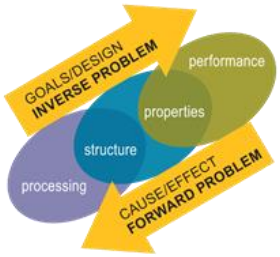
LEADERSHIP	**9** NRT Faculty • **10+** Affiliated • External Advisory Board • Internal Admin. Council
TRAINEES	**41** NRT-funded MS, PhD Students • **40+** Additional Participants • **2** Education PhDs
INCLUSION	Broad Recruitment Strategies • Partnership w/ URM Schools • Targeted Fellowships Learning Community • Faculty/Peer Mentoring • Individual Development Plan

EDUCATION

PEDAGOGICAL MODEL

Emphasis on Developing Employer-desired Professional and Technical Skills

RESEARCH



- Impact of Pedagogical Methods
- Goal Oriented Materials Design
- Data-Enabled Materials Discovery

PARTNERS — **Texas A&M University** (Center for New Ventures and Entrepreneurship, Energy Institute, Center for Teaching Excellence, Office of Graduate and Professional Studies); **Other Academic Institutions; Industry; National Laboratories**